

## CLAIMS

*What is claimed is:*

- 1        1. A single photon read-out circuit comprising:
  - 2              a feed-back enhanced reset amplifier;
  - 3              a photodetector connected to an output of the reset amplifier; and
  - 4              a high-gain amplifier connected to the photodetector.
- 1        2. The circuit of Claim 1, wherein the high-gain amplifier comprises:
  - 2              an adaptive skimming circuit having an integration capacitor..
- 1        3. The circuit of Claim 2, further comprising a source follower transistor  
2        connected to the output of the input transistor.
- 1        4. The circuit of Claim 3, further comprising an access transistor connected  
2        between the input transistor and a bus.
- 1        5. The circuit of Claim 4, wherein the reset amplifier comprises a CMOS  
2        inverter.
- 1        6. The circuit of Claim 5, further comprising a reset transistor.
- 1        7. The circuit of Claim 6, further comprising a sample-and-hold transistor and  
2        a sample-and-hold capacitor.
- 1        8. The circuit of Claim 5, wherein the reset amplifier further comprises an  
2        autozero transistor, a first capacitor, and a second capacitor.
- 1        9. The circuit of Claim 5, wherein the reset amplifier further comprises a  
2        current source shared by all pixels on a bus.
- 1        10. A focal plane array (FPA) having a plurality of pixel cells, each pixel cell  
2        comprising:
  - 3              a feed-back enhanced reset amplifier;
  - 4              a photodetector connected to an output of the reset amplifier; and
  - 5              a high-gain amplifier connected to the photodetector, the high-gain  
6        amplifier comprising:

7                   an input transistor;  
8                   a current source transistor connected to the input transistor;  
9                   a reset transistor connected to the current source transistor; and  
10                  an adaptive skimming circuit having an integration capacitor;  
11                  wherein the reset amplifier reduces kTC noise, and the high-gain  
12                  amplifier nulls current associated with the photodetector to reduce signal non-  
13                  uniformity.

1                  11. An amplifier circuit for single photon read-out of photodetectors in an  
2                  imaging array, the circuit comprising:

3                  detector means for converting incident light to an input electric signal;  
4                  reset amplifier means connected to the detector means for suppressing  
5                  kTC noise, and  
6                  a high-gain amplifier means connected to the detector means for  
7                  reducing signal non-uniformity.

1                  12. A single photon read-out circuit comprising:

2                  a detector;  
3                  a reset transistor having a drain connected to the detector;  
4                  an inverter amplifier connected between the drain of the reset transistor  
5                  and a source of the reset transistor;  
6                  an input transistor having a source connected to the detector;  
7                  a current source transistor having a drain connected to a drain of the  
8                  input transistor; and  
9                  an adaptive skimming circuit connected to the current source transistor,  
10                 the adaptive skimming circuit comprising an integration capacitor.

1                  13. The circuit of Claim 12, further comprising a source follower transistor  
2                  having a source connected to the drain of the input transistor.

1        14. The circuit of Claim 12, further comprising a first capacitor connected  
2        between the drain of the reset transistor and the photodetector, and a second capacitor  
3        connected between the source of the reset transistor and photodetector.

1        15. The circuit of Claim 14, further comprising a current source, shared by all  
2        pixels on a bus, connected to the reset transistor and the inverter amplifier.